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A TREADLE SIFTER FOR EXAMINATION OF SOIL IN
STUDIES OF INSECTS

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During the winter of 1932-33 the writer found that full-grown larvae of the "raisin moth", Ephestia figulilella Greg., hibernate in the soil to a considerable extent. It appeared desirable to conduct quantitative studies of this soil hibernation in connection with current field life-history studies of the species. Several of the semiportable soil-sifting devices in use by entomologists were inspected, and one such device, selected as most nearly suitable, was constructed and given a trial. In use it failed to meet the necessary field requirements.

The hibernating larvae of the raisin moth are from 1/2 to 3/4 of an inch in length and construct silken hibernacula within the top 4 inches of soil. In quantitative sampling, it is essential to have a portable sifting device which can be operated by one worker and which allows freedom of the hands for digging and crumbling soil and collecting larvae.

The writer has constructed such a device which is light and easily carried, allows the operator to sit in such a position that both the soil to be sampled and the sifting screen are within convenient reach, and is foot-operated. The descriptive name, "treadle sifter", has been applied to this apparatus.

Construction

The accompanying drawing (fig. 1) shows details of construction. With the exception of the tongue and treadle bar, which are of oak, the framework is made of 3/4-inch soft pine boards, 8 inches wide, with cleats and braces 1 3/4 inches wide. The hardware includes:

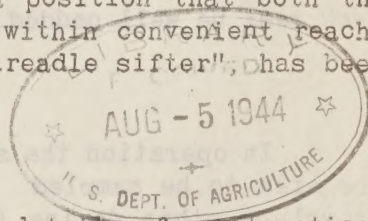
Two 10-inch shelf brackets serving as guides for the tongue.

Six 3/4-inch wood screws for attaching the brackets to the front upright and for securing the front baffle to the extended arms of the brackets.

Two stout 4-inch helical coiled springs attached by screw eyes to the front upright and the tongue.

One 2-inch box hinge for attaching the tongue to the tongue support.

*/ The writer's thanks are due to his associate, Dwight F. Barnes, for helpful suggestions in the designing of this apparatus.



Two 1½ inch strap hinges for securing the screen box to the tee at the top of the tongue. With this hinged arrangement of the screen, trash and pebbles can be quickly emptied out by overturning the box in front of the operator.

A strip of 1-inch angle iron - about 2 feet - for the treadle bar support. This iron strip, which may be worked cold, should be bent to suit the individual operator. The essential point is to bend it so that it will hold the treadle bar at a proper distance to allow comfortable operation.

Four 3/8 x 2 inch bolts, two with butterfly nuts to attach the treadle bar support to the tongue, at 4 inches from the base of the tongue, and allow for easy removal of the treadle bar when desired, and two to fasten the treadle bar to the support.

Copper screening of any desired mesh for covering the bottom of the screen box. For use with raisin moth larvae a 14-mesh screen, 10 inches on a side, has proven satisfactory.

Wood screws for securing all joints and braces, 1 3/4 inches long.

The entire cost of lumber and hardware should not exceed four dollars.

For the comfort of the operator it is essential that the seat and back rest be well padded.

Operation

In operation the sifter is set on the ground immediately alongside the area to be sampled. The operator, equipped with a stout gardener's trowel or other device for handling earth, occupies the seat, with the heels of his shoes resting in the angle of the bottom board and tongue support, and the toes on the treadle bar (fig. 2). Soil is placed in the screen box and at the same time the screen is shaken by forward and backward movements of the toes on the treadle bar. The tongue strikes the front baffle and the front upright with a jarring action at each forward and backward thrust, thus accelerating the sifting process. As desired, the operator can stop sifting and remove any insects in evidence. Furthermore, experience has shown that clods of earth which fail to break up may be picked out, held in the hand over the screen and struck sharply with the soil trowel, thus crumbling them without destroying the insects within.

With most soils, a certain amount of gravel, twigs, and leaf fragments always remains on the screen after the sifting of a load is completed. By concentrating all of the detritus toward the front of the box, then rasping the screen at the side nearer the operator with the trowel, the material slowly rolls back in a thin layer in which any insects previously overlooked may be readily detected.

But little practice is necessary before the inexperienced operator becomes proficient in the use of the treadle sifter. It has proven entirely satisfactory in sampling for the raisin moth with a variety of soil types in the San Joaquin Valley of California. There are, of course, conditions under which no soil sifter will operate effectively, notably in very moist and so-called "hard-pan" soils.

It appears that this device could be used to advantage in the study of a variety of insects. For example, the writer has had some experience in searching for white grubs and grasshopper egg pods. A treadle sifter with coarse screening would have been a most welcome addition to his collecting paraphernalia.

TREADLE SIFTER

